SYLLABUS – MAT 545
COMPLEX GEOMETRY, FALL 2021
Tues. and Thurs. 1:15–2:35 PM in Earth and Space 183

This course is an introduction to complex algebraic and differential geometry. We will present basic results in several complex variables. Many examples will be given, in particular examples of projective and Kaehler manifolds. We shall present: Wirtinger's inequality in Kaehler Manifolds, the basic theory of sheaves and sheaf cohomology, the theorems of de Rham and Dolbeault, vector bundles and Chern classes, Hodge Theory, the Hodge decomposition and the Hard Lefschetz Theorem, divisors and line bundles, The Kodaira Vanishing Theorem, Theorems of Lefschetz, and the Kodaira Embedding Theorem.

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Office Hours: Tu.-Thu 3:00 - 4:30 PM, or make an arrangement for another time (in my office or by Zoom). The best way to contact me is by e-mail, which I read often.

RESOURCE BOOKS:

1. *Principles of Algebraic Geometry*, Phillip Griffiths and Joseph Harris, John Wiley and Sons, New York, 1978.

2. *Complex Geometry - An Introduction*, Daniel Huybrechts, Springer, Berlin, 2005.

3. *Complex Manifolds*, Kunihiko Kodaira and James Morrow, Holt, Rinehart and Winston, New York, 1971.

4. *Differential Analysis on Complex Manifolds*, R. O.Wells, Jr., Holt, Prentice-Hall, 1973 New York, 1971.

5. *variétés kählerériennes*, André Weil, Hermann, Paris, 1971

COURSE OUTLINE

Part 1: Basic material from several complex variables, and results of Weierstrauss.
Part 2: Kaehler manifolds and Wirtinger's inequality.
Part 3: Presheaves, sheaves and sheaf cohomology.
Part 4: Theorems of de Rham and Dolbeault.
Part 5: Complex vector bundles, connections and curvature; Chern classes.
Part 6: Hodge Theory.
Part 7: The Hodge decomposition and the Hard Lefschetz Theorem on Kaehler manifolds.
Part 8: Divisors and line bundles.
Part 9: The Kodaira Vanishing Theorem
Part 10: Lefschetz Theorem on Hyperplane Sections.
Part 11: Lefschetz Theorem on (1,1)-Classes.
Part 12: The Kodaira Embedding Theorem

Disability Support Services: If you have a physical, psychological, medical, or learning disability that may affect your course work, please contact Disability Support Services (DSS) office: ECC (Educational Communications Center) Building, room 128, telephone (631) 632-6748/TDD. DSS will determine with you what accommodations are necessary and appropriate. Arrangements should be made early in the semester (before the first exam) so that your needs can be accommodated. All information and documentation of disability is confidential. Students requiring emergency evacuation are encouraged to discuss their needs with their professors and DSS. For procedures and information, go to the following web site http://www.ehs.sunysb.edu and search Fire safety and Evacuation and Disabilities.

Academic Integrity: Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty are required to report any suspected instance of academic dishonesty to the Academic Judiciary. For more comprehensive information on academic integrity, including categories of academic dishonesty, please refer to the academic judiciary website at http://www.stonybrook.edu/uaa/academicjudiciary/.

Critical Incident Management: Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of Judicial Affairs any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, and/or inhibits students' ability to learn.